Additional examples:

2) $12x^5 + 18x^7$

$12x^5 + 18x^7 = 6x^5(2 + 3x^2)$

4) $24y^4 - 8y^2$

$24y^4 - 8y^2 = 8y^2(3y^2 - 1)$

6) $30a^3b^4 + 20a^4b^3$

$30a^3b^4 + 20a^4b^3 = 10a^3b^3(3b + 2a)$

8) $14x^6y^3 - 6x^2y^4$

$14x^6y^3 - 6x^2y^4 = 2x^2y^3(7x^4 - 3y)$

10) $3a^2 - 3a - 6$

$3a^2 - 3a - 6 = 3(a^2 - a - 2) = 3(a + 1)(a - 2)$

$+(1) \quad -(2)$

$= -1$

12) $2x^3 - 14x^2 + 20x$

$2x^3 - 14x^2 + 20x = 2x(x^2 - 7x + 10) = 2x(x - 2)(x - 5)$

$-(2) \quad -(5)$

$= -7$

14) $3a(x - y) - 7b(x - y)$

$3a(x - y) - 7b(x - y) = \{3a(x - y) - 7b(x - y)\} = (x - y)\{3a - 7b\} = (x - y)(3a - 7b)$

16) $10x^3(2x - 3y) - 15x^2(2x - 3y)$

$10x^3(2x - 3y) - 15x^2(2x - 3y) = \{10x^3(2x - 3y) - 15x^2(2x - 3y)\}$

$= 5x^2(2x - 3y)\{2x - 3\} = 5x^2(2x - 3y)(2x - 3)$

18) $2x^2(x + 2) + 13x(x + 2) + 15(x + 2)$

$2x^2(x + 2) + 13x(x + 2) + 15(x + 2) = \{2x^2(x + 2) + 13x(x + 2) + 15(x + 2)\} = (x + 2)\{2x^2 + 13x + 15\}$

$= (x + 2)\{(2x + 3)(1x + 5)\} = (x + 2)(2x + 3)(x + 5)$

$+\{1\}(3) + \{2\}(5)$

$= +3 + 10$

$= +13$

20) $5xy^2+5y^2+3ax+3a$

$$5xy^2+5y^2+3ax+3a=(5xy^2+5y^2)+(3ax+3a)=5y^2(x+1)+3a(x+1)=\{5y^2(x+1)+3a(x+1)\}$$
$$=(x+1)\{5y^2+3a\}=(x+1)(5y^2+3a)$$

22) $x^3y^3+2x^3+5x^2y^3+10x^2$

$$x^3y^3+2x^3+5x^2y^3+10x^2=(x^3y^3+2x^3)+(5x^2y^3+10x^2)=x^3(y^3+2)+5x^2(y^3+2)$$
$$=\{x^3(y^3+2)+5x^2(y^3+2)\}=(y^3+2)\{x^3+5x^2\}$$
$$=(x^3+5x^2)(y^3+2)=x^2(x+5)(y^3+2)$$

24) $ax-x^2-bx+ab$

$$ax-x^2-bx+ab=ax-x^2+ab-bx=(ax-x^2)+(ab-bx)=x(a-x)+b(a-x)=\{x(a-x)+b(a-x)\}$$
$$=(a-x)\{x+b\}=(a-x)(x+b)$$

26) $x^2-xy-ax+ay$

$$x^2-xy-ax+ay=(x^2-xy)-(ax-ay)=x(x-y)-a(x-y)=\{x(x-y)-a(x-y)\}$$
$$=(x-y)\{x-a\}=(x-y)(x-a)$$

28) $x^2-7x+12$

$$x^2-7x+12=(x-3)(x-4)$$
$$-(3)\quad -(4)$$
$$=-7$$

30) x^2+x-12

$$x^2+x-12=(x+4)(x-3)$$
$$+(4)\quad -(3)$$
$$=+1$$

32) y^2-y-6

$$y^2-y-6=(y+2)(x-3)$$
$$+(2)\quad -(3)$$
$$=-1$$

34) $3+2x-x^2$

$$3+2x-x^2=-x^2+2x+3=-(x^2-2x-3)=-(x+1)(x-3)=-(-3+x)(1+x)=(3-x)(1+x)$$
$$+(1)\quad -(3)$$
$$=-2$$

36) $15-2x-x^2$

$15-2x-x^2=-x^2-2x+15=-(x^2+2x-15)=-(x+5)(x-3)=-(-3+x)(5+x)=(3-x)(1+x)$

$+(5)\ -(3)$

$=+2$

38) $x^2-5xy-24y^2$

$x^2-5xy-24y^2=(x+3y)(x-8y)$

$+(3)\ -(8)$

$=-5$

40) $a^2-8ab-9b^2$

$a^2-8ab-9b^2=(a+1b)(a-9b)=(a+b)(a-9b)$

$+(1)\ -(9)$

$=-8$

42) $x^2+14xa+48a^2$

$x^2+14xa+48a^2=(x+8a)(x+6a)$

$+(8)\ +(6)$

$=+14$

44) $x^2+10xb+25b^2$

$x^2+10xb+25b^2=(x+5b)(x+5b)=(x+5b)^2$

$+(5)\ +(5)$

$=+10$

46) $2x^2-7x-15$

$2x^2-7x-15=(2x+3)(1x-5)=(2x+3)(x-5)$

$+\{1\}(3)-\{2\}(5)$

$=+3-10$

$=-7$

48) $2x^2-x-15$

$2x^2-x-15=(2x+5)(1x-3)=(2x+5)(x-3)$

$+\{1\}(5)-\{2\}(3)$

$=+5-6$

$=-1$

50) $2x^2+13x+15$

$2x^2+13x+15=(2x+3)(1x+5)=(2x+3)(x+5)$

$+\{1\}(3)+\{2\}(5)$

$=+3+10$

$=+13$

52) $2x^2+11x+15$

$2x^2+11x+15=(2x+5)(1x+3)=(2x+5)(x+3)$

$+\{1\}(5)+\{2\}(3)$

$=+5+6$

$=+11$

54) $2x^2-7x-15$ [This is the same as exercise 46]

56) $2-7a+6a^2$

$2-7a+6a^2=(2-3a)(1-2a)$

$-\{1\}(3)-\{2\}(2)$

$=-3-4$

$=-7$

58) $72y^2+60y-72$

$72y^2+60y-72=12(6y^2+5y-6)=12(2y+3)(3y-2)$

$+\{3\}(3)-\{2\}(2)$

$=+9-4$

$=+5$

60) $3x^4+2x^3-5x^2$

$3x^4+2x^3-5x^2=x^2(3x^2+2x-5)=x^2(3x+5)(1x-1)=x^2(3x+5)(x-1)$

$+\{1\}(5)-\{3\}(1)$

$=+5-3$

$=+2$

62) $40r^3 + 200r^2 + 250r$

$$40r^3 + 200r^2 + 250r = 10r(4r^2 + 20r + 25) = 10r(2r+5)(2r+5) = 10r(2r+5)^2$$

$$+\{2\}(5) + \{2\}(5)$$
$$= +10 + 10$$
$$= +20$$

64) $3x^2 + 19xy - 14y^2$

$$3x^2 + 19xy - 14y^2 = (1x + 7y)(3x - 2y) = (x + 7y)(3x - 2y)$$

$$+\{3\}(7) - \{1\}(2)$$
$$= +21 - 2$$
$$= +19$$

66) $9x^2 + 9xa - 10a^2$

$$9x^2 + 9xa - 10a^2 = (3x + 5y)(3x - 2y)$$

$$+\{3\}(5) - \{3\}(2)$$
$$= +15 - 6$$
$$= +9$$

68) $6a^2 - 7ab - 5b^2$

$$6a^2 - 7ab - 5b^2 = (2a + 1b)(3a - 5b) = (2a + b)(3a - 5b)$$

$$+\{3\}(1) - \{2\}(5)$$
$$= +3 - 10$$
$$= -7$$

70) $200 - 600t - 350t^2$

$$200 - 600t - 350t^2 = 50(4 - 12t - 7t^2) = 50(2 + 1t)(2 - 7t) = 50(2 + t)(2 - 7t)$$

$$+\{2\}(1) - \{2\}(7)$$
$$= +2 - 14$$
$$= -12$$

72) $4y^5 + 7y^4 - 2y^3$

$$4y^5 + 7y^4 - 2y^3 = y^3(4y^2 + 7y - 2) = y^3(1y + 2)(4y - 1) = y^3(y + 2)(4y - 1)$$

$$+\{4\}(2) - \{1\}(1)$$
$$= +8 - 1$$
$$= +7$$

74) $60a^2 + 65a^3 - 20a^4$

$$60a^2 + 65a^3 - 20a^4 = 5a^2(12 + 13a - 4a^2) = 5a^2(3 + 4a)(4 - 1a) = 5a^2(3 + 4a)(4 - a)$$

$$+\{4\}(4) - \{3\}(1)$$
$$= +16 - 3$$
$$= +13$$

76) $8x^4y^2 - 47x^3y^3 - 6x^2y^4$

$$8x^4y^2 - 47x^3y^3 - 6x^2y^4 = x^2y^2(8x^2 - 47xy - 6y^2) = x^2y^2(8x + 1y)(1x - 6y) = x^2y^2(8x + y)(x - 6y)$$

$$+\{1\}(1) - \{8\}(6)$$
$$= +1 - 48$$
$$= -47$$

78) $600x^4 - 100x^2 - 200$

$$600x^4 - 100x^2 - 200 = 100(6x^4 - x^2 - 2) = 100(2x^2 + 1)(3x^2 - 2) = 100(2x^2 + 1)(3x^2 - 2)$$

$$+\{3\}(1) - \{2\}(2)$$
$$= +3 - 4$$
$$= -1$$

80) $2x^2(x + 2) + 13x(x + 2) + 15(x + 2)$

$$2x^2(x + 2) + 13x(x + 2) + 15(x + 2) = \{2x^2(x + 2) + 13x(x + 2) + 15(x + 2)\}$$
$$= (x + 2)\{2x^2 + 13x + 15\}$$
$$= (x + 2)\{(2x + 3)(1x + 5)\} = (x + 2)(2x + 3)(x + 5)$$

$$+\{1\}(3) + \{2\}(5)$$
$$= +3 + 10$$
$$= +13$$

82) $2x^2(x + 1) + 7x(x + 1) + 6(x + 1)$

$$2x^2(x + 1) + 7x(x + 1) + 6(x + 1) = \{2x^2(x + 1) + 7x(x + 1) + 6(x + 1)\}$$
$$= (x + 1)\{2x^2 + 7x + 6\}$$
$$= (x + 1)\{(1x + 2)(2x + 3)\} = (x + 1)(x + 2)(2x + 3)$$

$$+\{2\}(2) + \{1\}(3)$$
$$= +4 + 3$$
$$= +7$$